ADDITIONAL SCYTHIAN AMMONOIDS FROM AFGHANISTAN

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INTRODUCTION

The Lower Triassic formations and faunas of Afghanistan were essentially unknown until publication of the recent monograph by Kummel and Erben (1968). That report was based on field observations and collections made by H. K. Erben at Kotal-e-Tera, near the village of Altimur, 90 kilometers southeast of Kabul, Afghanistan (Fig. 1). In that monograph the Triassic section at Kotal-e-Tera was shown to consist of a relatively thin, gray limestone unit containing an ammonoid fauna of mid-Scythian (*Owenites* Zone) age. This gray limestone sequence overlies dolomites of Permian age and is overlain by black limestones that contain ammonoids of Anisian age.

In August of 1966 I had the opportunity to visit Kotal-e-Tera and make additional observations and collections on these Triassic formations. The most important result from the visit was the discovery in the uppermost part of the lower Triassic (Scythian) limestone formation of a *Subcolumbites* fauna of late Scythian age. The paper by Kummel and Erben was submitted in November, 1964, and was in press, thus this new information is presented here as a separate contribution.

ACKNOWLEDGMENTS

It gives me great pleasure to acknowledge the warm hospitality and help given me by Dr. Klaus P. Vogel, Chief of the Bonn University Geological Mission to the University of Kabul. Professor H. K. Erben of Bonn University kindly helped in preliminary arrangements for my visit. I was very ably assisted in the field by Mr. K. Azizullah Kureishie, a graduate student in geology at the University of Kabul. My trip was made possible by a generous grant from the Shaler Fund of Harvard University. Miss Victoria Kohler aided in the preparation, photography, and illustrations of the specimens, with her usual good will and skill. The laboratory aspects of this study were supported by National Science Foundation grant GB-5109X.

STRATIGRAPHY

Triassic formations crop out extensively in the general region of the village of Altimur and around Kotal-e-Tera. The road from Kabul to Gardez (12 kms south of Altimur) crosses the main band of outcrops. There is an excellent exposure of the Permian and Triassic formations on the east side of the Kabul-Gardez road. At this outcrop I was able to measure the following section (Fig. 2):

K7. Mudstone, black, calcareous, contains abundant ammonoids which, however, generally cannot be extracted. Unit overlain by alluvium, thickness given is only that of beds exposed. 50 feet

K6. Limestone, light to dark

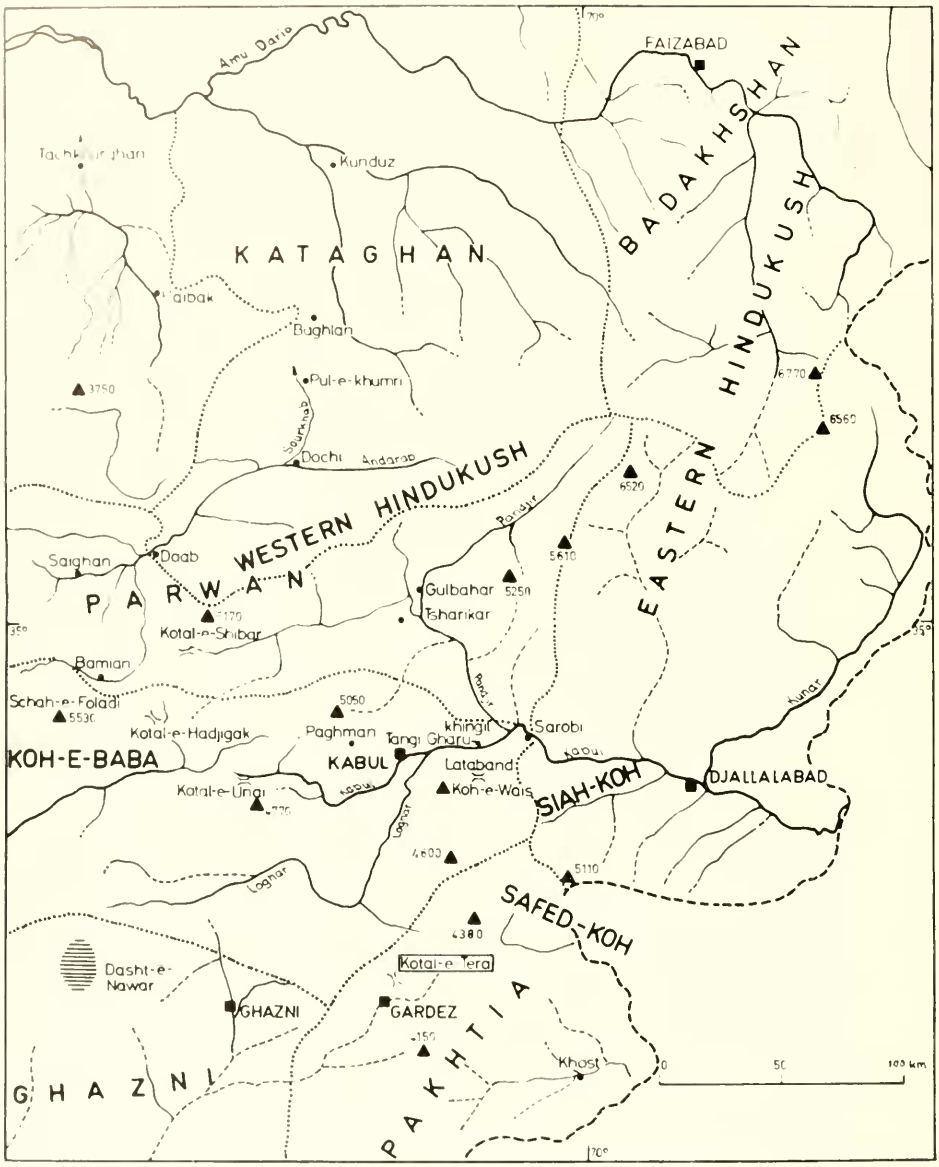

Figure 1. Locality map of northeastern Afghanistan showing location of Kotal-e-Tera.

gray, made up of shell fragments, matrix of fine-grained calcite, unit very hard; contains abundant ammonoids but preservation poor and very difficult to extract. 11

K5. Limestone, red, massive, very fine grained, dolomitic in patches, with abundant shell fragments; contains ammonoids but these are difficult to extract from the rock. 1

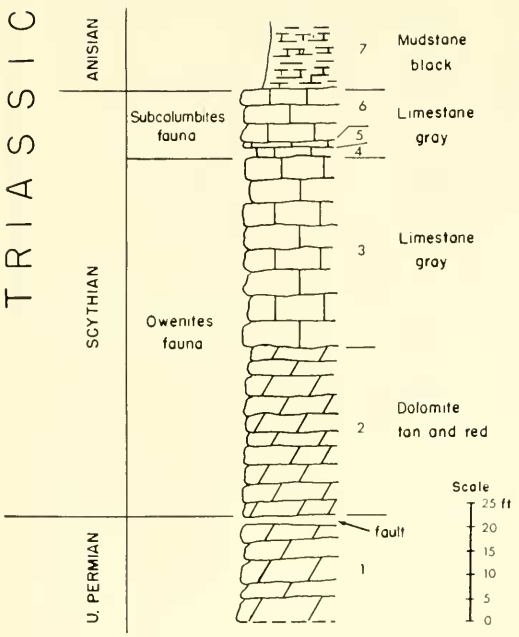

Figure 2. Columnor section of uppermost Permian and Triassic strata cropping out along the east side of the Kabul-Gardez road at Kotal-e-Tera.

K4. Limestone, gray, made up of shell fragments, with very fine-grained matrix, thin bedded, unit weak, no fossils seen. 2

K3. Limestone, gray, made up of shell fragments with very fine- to fine-grained matrix, partly dolomitic; contains abundant ammonoids. 40

K2. Dolomite, buff to gray, fine- to medium-grained, upper part red in color; contains abundant ammonoids. 35

K1. Dolomite, gray, massive, no fossils seen, unit poorly exposed. 16

Bed K1 of the above section is just the upper part of the Permian formations exposed at Kotal-e-Tera and is in fault contact with bed K2. The *Owenites* fauna described by Kummel and Erben (1968) is present in beds K2 and K3. From this outcrop and from that on the west side of the Kabul-Gardez road, Kummel and Erben (1968) recognized the following species of ammonoids:

Pseudosageceras multilobatum Noetling
Subinyoites cf. *kashmiricus* (Diener)
Subvishnuites welteri Spath
Xenodiscoides cf. *falcatum* (Waagen)
Dieneroceras knechti (Hyatt and Smith)
Clypeoceras yudishthira (Diener)
Eoptychites sp. indet.
Owenites koeneni Hyatt and Smith
Owenites slavini (Popov)
Paranannites aspenensis Hyatt and Smith
Juvenites sp. indet.
Anakashmirites angustecostatus (Welter)
Meekoceras gracilitatis White
Arctoceras mushbachanum (White)
Hemiprionites hungeri Kummel
Anasibirites kingianus (Waagen)

My new collections from the *Owenites* beds at Kotal-e-Tera contain four additional species which are described here. These are

Juvenites cf. *septentrionalis* Smith
Wyomingites aplanatus (White)
Hemiprionites typus (Waagen)
Wasatchites sp. indet.

Beds K5 and K6 contain a *Subcolumbites* fauna. Though bed K4 yielded no fossils it is lithologically more related to beds K5 and K6 than to the underlying units. The major part of the fossil collections was obtained from bed K6. This *Subcolumbites* fauna includes the following species:

Pseudosageceras multilobatum Noetling
Subvishnuites sp. indet.
Subvishnuites cf. *enveris* (Arthaber)
Xenoceltites sp. indet.
Procarnites kokeni (Arthaber)
Isculitoides cf. *originis* (Arthaber)
Subcolumbites perrinismithi (Arthaber)
Vickohlerites cf. *sundaicus* (Welter)
Meropella cf. *plejanae* Renz and Renz
Albanites triadicus (Arthaber)
Keyserlingites sp. indet.
Leiophyllites sp. indet.

Figure 3. Index map of localities where faunas of *Owenites* Zone age have been reported. (1) Lower limestone member of Thaynes Formation in southwestern Montana, southeastern Idaho, and northern Utah; (2) Thaynes Formation of northeastern Nevada and west-central Utah; (3) Maenkopi Formation of southwestern Utah; (4) Inya Mountains, southern California; (5) northeastern Washington; (6) Sulphur Mountain beds of Alberta; (7) Needham Creek area, British Columbia; (8) Liard River area, British Columbia; (9) Ellesmere Island and Axel Heiberg Island; (10) Herlufshalm, Peary Land; (11) Spitsbergen; (12) Olenek-Lena River Basin, Siberia; (13) Okhatsk-Kolyma Land, Siberia; (14) Primorye Region around Vladivostok; (15) Iwai Formation of Kwanto Massif, Taho Formation of Shikoku, and Kamura Formation of Kyushu, Japan; (16) Malakoff Hill Group, Coal Creek, Wairakei Downs, South Island, New Zealand; (17) limestone with *Owenites* fauna, limestone with *Ophiceras crassecostatum*, and limestone with *Anasibirites multiformis*, Timor; (18) Gua Panjang fauna, Malaya; (19) *Owenites* beds of Kwangsi, China; (20) *Hedenstroemia* fauna of Himalayas in northern India, Kashmir, and Tibet; (21) upper Mittiwali Member of Mianwali Formation, Salt Range and Surghar Range, West Pakistan; (22) *Owenites* fauna of Kotal-e-Tera, Afghanistan; (23) *Owenites* fauna of northern Caucasus Mountains; (24) *Meekoceras* fauna of Yugoslavia; (25) Barabanja fauna of northeastern Madagascar.

Bed K7 is of Anisian age. Kummel and Erben (1968) have recorded the following ammonoids from this unit:

Beyrichites khanikofi (Oppel)
Discoptychites sp. indet.
Malletoptychites malletianus (Stoliczka)
Gymnites sp. indet.

The Triassic formations west of the Kabul-Gardez road crop out much more extensively than east of the road but are cut by numerous cross-faults. The sequence of units is the same as east of the road. The beds including the *Owenites* fauna are much more fossiliferous west of the road than they are on the east. However, the upper beds with the *Subcolumbites* are much less fossiliferous west of the road than they are to the east.

CORRELATION WITH REGIONS OUTSIDE OF AFGHANISTAN

Owenites Fauna

This is one of the most widespread and diverse of all Scythian faunas. The major localities of the world where faunas of this age are known are plotted on the map of Figure 3. A plot of the distribution of the genera represented in the *Owenites* fauna at Kotal-e-Tera is given on Table 1. The paper by Kummel and Erben (1968) contains a fairly detailed discussion and comparison of the Kotal-e-Tera *Owenites*

	Yugoslavia	Caucasus Mts.	Madagascar	Afghanistan	Salt Range, W. Pakistan	Kashmir	Spiti Region, Himalayas	Malaya	Timor (*Ophiceras* fauna)	Timor (*Owenites* fauna)	Timor (*Anasibirites* fauna)	New Zealand	China	Japan	Primorye Region	Siberia	Spitsbergen	Ellesmere Island	British Columbia	Western U.S.	Range of genus
Pseudosageceras	?	×	×	×	×	×	×	×	×				×		×		×	×		×	–
Subinyoites				×																	e
Subvishnuites		×		×						×		×	×								l
Xenodiscoides				×	×																×
Dieneroceras		×		×	?								×	×	×	×				×	l
Clypeoceras			×	×	×		×						×			?				×	×
Eoptychites			?	×	×		?														×
Owenites		×		×				×		×	×	×	×	×	×					×	×
Paranannites			×	×									×	×		×				×	×
Juvenites		×	×	×		×	×			×			×	×				×	×	×	×
Anakashmirites				×	×		×		×	×			×					×		×	l
Meekoceras	?			×	?		×						×		×	×		×		×	×
Arctoceras				×			×			×			×		×	×	×	×	×	×	×
Wyomingites		×		×								×					?			×	×
Hemiprionites				×	×									×		×	×			×	×
Wasatchites				×	×										×		×	×	×	×	×
Anasibirites				×	×		×				×		×	×	×	×				×	×

TABLE 1. GEOGRAPHIC DISTRIBUTION OF GENERA PRESENT IN THE *OWENITES* FAUNA AT KOTAL-E-TERA, AFGHANISTAN. SYMBOLS IN RIGHT HAND COLUMN AS FOLLOWS: ×, PRESENT ONLY AT THIS HORIZON; –, PRESENT IN BOTH YOUNGER AND OLDER HORIZONS; l, PRESENT ALSO IN LATER HORIZONS; e, PRESENT ALSO IN EARLIER HORIZONS.

fauna with faunas believed to be of the same age from other parts of the world. The new species added to the Kotal-e-Tera *Owenites* faunal collection (*Juvenites* cf. *septentrionalis*, *Wyomingites aplanatus*, *Hemiprionites typus*, and *Wasatchites* sp. indet.) further strengthen the conclusions arrived at earlier as to the affinities of this fauna. The species of *Juvenites* and *Wyomingites* are very common members of the *Meekoceras* fauna of western United States. *Hemiprionites typus* was originally described from the Upper Ceratite limestone of the Salt Range of West Pakistan (Waagen, 1895). This formation also yielded the type of *Anasibirites kingianus* (Waagen, 1895). *Wasatchites* is another, quite common, member of the so-called *Anasibirites* fauna.

In the Kummel and Erben (1968) paper on the Kotal-e-Tera collections, it was stated that there was complete mixing of the *Owenites* and *Anasibirites* faunas. One collection by H. K. Erben was made from the basal part of their gray limestone unit (collection A-3 in Kummel and Erben, 1968) and another from the rest of the unit (collection A-2). Both collections contain a so-called mixed fauna. During my own field investigation of the Kotal-e-Tera region I was not able to find any anasibiritid elements in my unit K2. Within my unit K3, mixing of the faunas was very evident.

Subcolumbites Fauna

The *Subcolumbites* fauna of Kotal-e-Tera comprises 12 species placed in 11 genera. The list of species in this fauna is given on page 488. The geographic distribution of the genera is shown on Table 2 and

	Albania (*Subcolumbites* fauna)	Chios (*Subcolumbites* fauna)	Mangyshlak Peninsula	Kotal-e-Tera, Afghanistan (*Subcolumbites* fauna)	Salt and Surghar ranges West Pakistan	Timor (*Prolungarites* fauna)	Kwangsi,China (*Subcolumbites* fauna)	Japan (*Subcolumbites* fauna)	Primorye Region (*Subcolumbites* fauna)	Olenek Region (*Olenekites* fauna)	Spitsbergen (*Keyserlingites* fauna)	Ellesmere Island (*Keyserlingites* fauna)	British Columbia (Toad-Grayling Formation)	Tobin Range (*Subcolumbites* fauna)	Confusion Range Utah	S.E. Idaho (*Prolungarites* fauna)	Range of genera
Pseudosageceras	×	×	×	×	×	×			×	×				×	×	×	e
Subvishnuites	×			×	×												e
Xenoceltites				×	×		×		×								e
Procarnites	×	×	×	×	×	×	×		×				×				×
Isculitoides	×	×		×	×	×	×		×				×	×		×	×
Subcolumbites	×	×		×		×	×	×	×					×			×
Vickohlerites		×		×													×
Meropella		×		×													×
Albanites	×	×	×	×		×											×
Keyserlingites				×						×	×	×	×	×		×	×
Leiophyllites	×	×	×	×			×		×				×				l

TABLE 2. GEOGRAPHIC DISTRIBUTION OF GENERA PRESENT IN THE *SUBCOLUMBITES* FAUNA AT KOTAL-E-TERA, AFGHANISTAN. SYMBOLS IN RIGHT HAND COLUMN AS FOLLOWS: ×, PRESENT ONLY AT THIS HORIZON; –, PRESENT IN BOTH YOUNGER AND OLDER HORIZONS; l, PRESENT ALSO IN LATER HORIZONS; e, PRESENT ALSO IN EARLIER HORIZONS.

the localities of late Scythian faunas are shown on the map of Figure 4. A number of the species in this fauna are prominent members of late Scythian faunas in several localities within Tethys from Albania to Timor. There is for instance *Albanites triadicus* (Arthaber), first described from the *Subcolumbites* fauna of Albania (Arthaber, 1908, 1911). In a comprehensive treatment of all late Scythian ammonoids, Kummel (1968b) has presented data to show that all of the many species of the genus *Albanites* that have been proposed are in reality synonyms of *Albanites triadicus*. In fact the genus *Albanites* is monotypic and confined to Tethys. In addition to its occurrence in the *Subcolumbites* fauna of Albania and at Kotal-e-Tera, Afghanistan, the species is present in the *Subcolumbites* fauna of Chios (Renz and Renz, 1948), the Mangyshlak Peninsula (Astakhova, 1960a, b) and the *Prolungarites* fauna of Timor. Another common and distinctive species of late Scythian age is *Procarnites kokeni*. It is present in late Scythian faunas of Albania, Chios, Mangyshlak Peninsula, Surghar Range in West Pakistan, Timor, and in Kwangsi, China. An equally widespread and distinctive species is *Subcolumbites perrinismithi* which is known from late Scythian faunas of Albania, Chios, Kwangsi and Japan. *Isculitoides originis* is now known from the late Scythian faunas of Albania, Chios, and Timor. It most probably is also present in the late Scythian fauna of the Narmia Member of the Mianwali Formation in the Salt Range and Surghar Range of West Pakistan. In regards to *Meropella*, this is the first record of a specimen of this genus outside of the *Subcolumbites* fauna of Chios. Species of *Xenoceltites*, *Subvishnuites*, and *Leiophyllites* are not common in the late Scythian. This is the first record of a late Scythian *Keyserlingites* from Tethys, though species of Anisian age are known from the Himalayas and Timor. Late Scythian species of *Keyserlingites* are known mainly from the circumarctic region and western North America.

Figure 4. Index map of localities where faunas of *Prohungarites* Zone age have been reported. (1) Upper Thaynes Formation, southeastern Idaho; (2) Upper Thaynes Formation, west-central Utah; (3) Tobin Formation, Tobin Range, Nevada; (4) *Subcolumbites* fauna Providence Range, southeastern California; (5) Humboldt Range, Nevada; (6) Toad-Grayling Formation, northeastern British Columbia; (7) upper Scythian of Ellesmere Island and Axel Heiberg Island; (8) Spitsbergen; (9) Olenek-Lena River Basin, Siberia; (10) Okhotsk-Kolyma Land, Siberia; (11) Primorye Region around Vladivostok; (12) Osawa Formation near Sendai, Japan; (13) south Otago, South Island, New Zealand; (14) *Prohungarites* fauna, Nifoekoko, Timor; (15) *Subcolumbites* fauna, Kwangsi, China; (16) *Prohungarites* fauna, Kashmir, Himalayas; (17) Narmia Member, Mianwali Formation, Salt Range and Surghar Range, West Pakistan; (18) *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan; (19) Tyur-Upa suite, Mangyshlak Peninsula, Caspian region; (20) *Subcolumbites* fauna of Chios; (21) *Subcolumbites* fauna of Albania; (22) *Tirolites* fauna of Campil Member of Werfen Formation.

SYSTEMATIC PALEONTOLOGY[1]

Class CEPHALOPODA Cuvier, 1797
Subclass AMMONOIDEA Zittel, 1884
Family SAGECERATIDAE Hyatt, 1900
Genus *PSEUDOSAGECERAS* Diener, 1895

Type species, *Pseudosageceras multilobatum* Noetling, 1905

Pseudosageceras multilobatum Noetling, 1905

A detailed synonymy of this species can be found in Kummel (1966). The *Subcolumbites* fauna at Kotal-e-Tera has yielded six fragmentary specimens; however, the distinctive character of the suture and conch shape makes recognition of the species comparatively easy. The *Owenites* fauna at Kotal-e-Tera has yielded a single specimen of this species. No other species of Scythian ammonoid is as long ranging or as widespread geographically. It is present in most ammonitiferous deposits of Scythian age.

Occurrence. *Owenites* fauna and *Subcolumbites* fauna at Kotal-e-Tera, Afghanistan.

Repository. MCZ 10166, 10173 (specimens from *Subcolumbites* fauna).

Family FLEMINGITIDAE Hyatt, 1900
Genus *SUBVISHNUITES* Spath, 1930

Type species, *Subvishnuites welteri* Spath, 1930 (= *Vishnuites* sp. Welter, 1922)

Subvishnuites sp. indet.

Plate 2, figure 14

Two small specimens of only fair preser-

[1] Abbreviations in this section are as follows: MCZ = Museum of Comparative Zoology; GPIBo = Geologisch-Paläontologisch Institut, Bonn; GSI = Geological Survey of India.

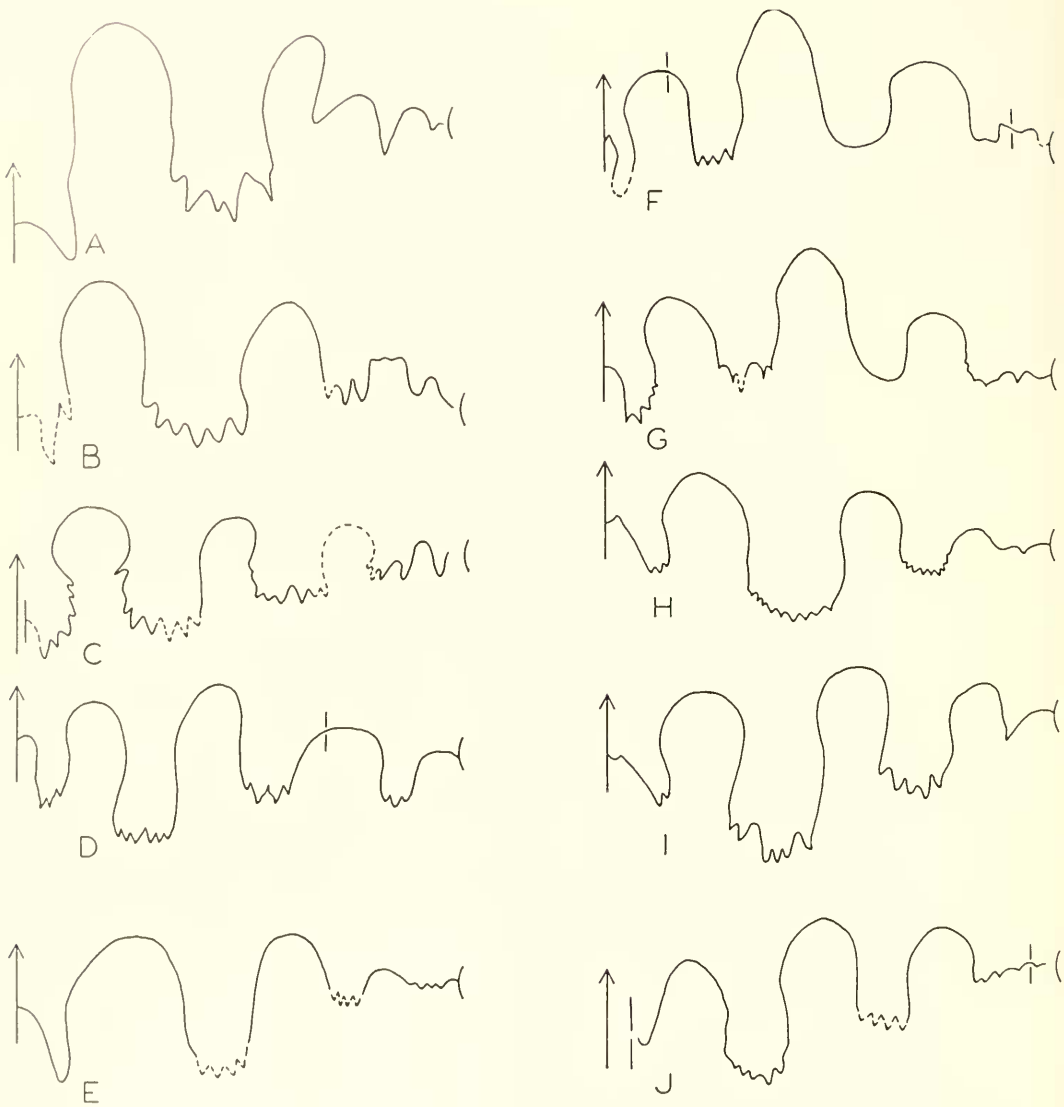

Figure 5. Diagrammatic representation of Scythian ammonoids from Kotal-e-Tera, Afghanistan. A, *Subcolumbites perrinismithi* (Arthaber) at a diameter of 14 mm, MCZ 10138; B, *Isculitoides* cf. *originis* (Arthaber) at a diameter of 16 mm, MCZ 10140; C, *Vickohlerites* cf. *sundaicus* (Welter) at a diameter of 20 mm, MCZ 10141; D, *Vickohlerites sundaicus* (Welter) at a diameter of 30 mm, holotype GPIBo 231; E, *Keyserlingites* sp. indet., at a diameter of 20 mm, MCZ 10143; F, *Albanites triadicus* (Arthaber) at a diameter of 45 mm, MCZ 10145; G, *Albanites triadicus* (Arthaber) at a diameter of 26 mm, from a weathered specimen, MCZ 10136; H, *Xenoceltites* sp. indet., at a diameter of 20 mm, MCZ 10137; I, *Leiophyllites* sp. indet., at a whorl height of 15 mm, MCZ 10151; J, *Wyomingites aplanatus* (White) at a diameter of 42 mm, MCZ 10163.

vation are in the collection. The distinctive features are the compressed, smooth, evolute conch, and the acute venter. The specimen which is illustrated has elliptical coiling and measures about 20 mm in diameter. The unfigured specimen has regular coiling and measures about 17 mm in diameter. The suture is not preserved on either of the specimens.

Most records of species of this genus are

based on few and generally poorly preserved specimens. The genus appears to be most common in the mid-Scythian *Owenites* Zone. The type species, *Subvishnuites welteri*, is from an *Owenites* fauna of Timor. It is now known from the same horizon in the Caucasus Mountains (described as *Parinyoites mastykensis* Popov, 1962), at Kotal-e-Tera, Afghanistan (Kummel and Erben, 1968), and from South Island, New Zealand (Kummel, 1959). The *Columbites* Zone contains a single Siberian species, described as *Inyoites eiekitensis* Popov (1962), which is quite similar to an indeterminate form in the *Columbites* fauna of southeast Idaho (Kummel, 1968b). The Narmia Member of the Mianwali Formation in the Surghar Range of West Pakistan contains poorly preserved and indeterminant species of *Subvishnuites* (Kummel, 1966). The horizon containing these specimens is of *Prohungarites* Zone age.

All the records to date on species of this genus, and especially on the specimens from the *Columbites* and *Prohungarites* zones, are woefully incomplete. The specimens all display smooth, compressed, evolute conchs, with acute venters. Any detailed analysis of this genus and its species will have to await the discovery of more abundant and better preserved specimens.

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10150 (Pl. 2, fig. 14), MCZ 10147 (unfigured specimen).

Subvishnuites cf. *enveris* (Arthaber)

Plate 1, figures 8, 9

Xenaspis enveris Arthaber, 1911: 230, pl. 20(4), figs. 3a, b.

A single fairly well preserved specimen in the collection is very similar to the specimen from the *Subcolumbites* fauna of Albania assigned by Arthaber (1911) to *Xenaspis enveris*. It is unfortunate that Arthaber's type, and only specimen, of this species is apparently lost, because the illustration is a retouched photograph. I have personally examined and studied the remaining specimens studied by Arthaber (1908, 1911); the preservation, in hard, red limestone, often obscures shell features and the specimens are very difficult to prepare; this fact makes all of Arthaber's illustrations suspect.

My specimen measures 45 mm in diameter, approximately 20 mm for the width of the adoral whorl, 21 mm for the height, and 11.7 mm for the width of the umbilicus. The whorl sides are broadly arched, converging on to a rounded venter. The whorl sides bear widely spaced radial ribs that commence and are most conspicuous on the umbilical shoulder and decrease in intensity toward the venter which is smooth. The adoral half volution has four such ribs. The ribs are likewise present on the inner whorls as far as they are preserved. The umbilical shoulder is abruptly rounded and the umbilical wall, nearly vertical. Unfortunately, no trace of the suture is preserved on any part of the specimen.

Arthaber's specimen of *Xenaspis enveris* is slightly more evolute than my Afghan specimen (34 per cent versus 27 per cent) and has an acute venter on the adoral part of the living chamber. The ribbing, according to Arthaber, is developed only on the living chamber. The absence of ribs on the phragmocone could well be a matter of preservation. The suture of the Albanian specimen consists of two denticulated lateral lobes (Arthaber, 1911: pl. 20(4), fig. 3c).

It appears quite probable that the Albanian *Xenaspis enveris* is not conspecific with the Afghan specimen recorded here, though they are most probably congeneric; however, the assignment of these specimens to the genus *Subvishnuites* is open to question. The type species of *Subvishnuites* is based on a single specimen from the *Owenites* fauna of Timor. It is an evolute form with an acute venter, and with smooth lateral areas. Conspecific forms have been described by Kummel (1959: 443) from an *Owenites* fauna of South Island, New Zealand, by Popov (1962b: 42, as *Parinyoites*

mastykensis) from an *Owenites* fauna of the Caucasus Mountains, and by Kummel and Erben (1968) from the *Owenites* fauna of Kotal-e-Tera, Afghanistan. In addition the *Owenites* Zone of Kwangsi, China, contains *Subvishnuites tientungensis* Chao (1959). The specimen from the *Dienerocerας* Zone of Siberia (Popov, 1962a) described as *Inyoites eiekitensis* is a species of this genus. The *Columbites* Zone of southeast Idaho has yielded one fragmentary specimen that is quite similar to the Siberian *S. eiekitensis*. The Narmia Member of the Mianwali Formation in the Trans-Indus Surghar range of West Pakistan has yielded fragmentary specimens of this genus described as *S.* sp. indet. by Kummel (1966). These specimens are of late Scythian *Prohungerites* Zone age.

All of the species and specimens of the *Subvishnuites* mentioned above are smooth forms with acute venters. The Albanian *Xenaspis enveris* and the Afghan specimen recorded here have prominent radial ribs beginning on the umbilical shoulder and decreasing toward the venter. A case could be made that the Albanian and Afghan species are generically distinct from the more typical species of *Subvishnuites*. However, data are so incomplete on both the Albanian and Afghan specimens that it would be imprudent to establish a new genus with either of these specimens as type. Because of these factors and because there are no other late Scythian genera to which these specimens have any similarity, it seems best to assign them to *Subvishnuites*.

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10148 (Pl. 1, figs. 8, 9).

Family XENOCELTITIDAE Spath, 1930

Genus *XENOCELTITES* Spath, 1930

Type species, *Xenoceltites subevolutus* Spath, 1930

Xenoceltites sp. indet.

Plate 2, figures 11–13

The genus *Xenoceltites* is very common and widely distributed in the mid-Scythian *Owenites* Zone. In the overlying *Columbites* Zone there is only one species, namely *X. spencei* (Smith, 1932). In the uppermost Scythian, *Prohungarites* Zone, there are only three recorded occurrences of species of this genus. There is first of all *Xenoceltites sinuatus* (Waagen) from the Narmia Member of the Mianwali Formation in the Salt Range of West Pakistan (Kummel, 1966). From Kwangsi, China, Chao (1959) has described *Xenoceltites crenoventrosus* from a *Subcolumbites* fauna. Finally, Kiparisova (1961) identified *X. spitsbergensis* from a *Subcolumbites* fauna in the Primorye Region. In all three of these reported occurrences, the species are established on very few specimens that in addition are only of poor to fair preservation.

The *Subcolumbites* fauna of Kotal-e-Tera has yielded three fragmentary specimens of fair preservation that clearly are xenoceltitids but which cannot be assigned with confidence to a particular species. The conch is moderately evolute with compressed whorls that are convergent to a narrowly rounded venter. The flanks bear forward-projecting constrictions. The suture is shown on Figure 5H. These Afghan specimens are quite similar to the fragmentary specimens Kummel (1966) has described from the Narmia Member of the Mianwali Formation in the Surghar Range of West Pakistan. *Xenoceltites sinuatus* (Waagen) from the same horizon in the adjacent Salt Range is known only from four fragmentary and generally poorly preserved specimens. These are all much larger than the specimen of *Xenoceltites* sp. indet. from the Surghar Range and the Afghan specimens recorded here, making direct comparison difficult and tenuous. The species from Kwangsi, China, *X. crenoventrosus* Chao (1959), is based on a single, fragmentary specimen of poor preservation. In this species the constrictions are very marked on the venter. The two specimens assigned by Kiparisova (1961) to *X. spitsbergensis* are quite similar to the

type of that species from the *Owenites* Zone of Spitsbergen. In this species the whorls are more rounded and the constrictions broader and more widely spaced.

The genus *Xenoceltites* is thus now known from late Scythian faunas at four localities, but each record leaves much to be desired, and comparisons are very difficult.

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10137 (Pl. 2, fig. 11), MCZ 10157 (Pl. 2, figs. 12, 13), MCZ 10169 (unfigured specimen).

Family PROPTYCHITIDAE Waagen, 1895

Genus *PROCARNITES* Arthaber, 1911

Type species, *Parapopanoceras kokeni* Arthaber, 1908

Procarnites kokeni (Arthaber) 1908

Plate 1, figure 16

Parapopanoceras kokeni Arthaber, 1908: 259, pl. 11(1), figs. 1a–c, 2a, b.

Hedenstroemia sp. Arthaber, 1908: 284, pl. 3, fig. 2.

Procarnites kokeni (Arthaber), 1911: 215, pl. 17(1), figs. 16, 17, pl. 18(2), figs. 1–5; Diener, 1915: 228; Diener, 1917: 167; C. Renz, 1928: 155; Spath, 1934: 181, fig. 55; Renz and Renz, 1947: 61; Renz and Renz, 1948: 81; pl. 8, figs. 5, 6–6a, 7–7a, 8–8a, 9–9a, pl. 9, figs. 2–2a; Kummel, *in* Arkell et al., 1957: L138, fig. 171, 4; Kummel, 1966: 390, pl. 2, figs. 10–13.

Procarnites kokeni var. *evoluta* Renz and Renz, 1947: 61; Renz and Renz, 1948: 82, pl. 9, figs. 1–1a.

Procarnites kokeni var. *panteleimonensis* Renz and Renz, 1947: 61, 78; Renz and Renz, 1948: 82, pl. 8, figs. 3–3a, pl. 9, figs. 3–3a.

Procarnites acutus Spath, 1934: 183, pl. 5, figs. 4a, b (= *Hedenstroemia* sp. Arthaber, 1908: 284, pl. 3, fig. 2); Chao, 1959: 89, 255, pl. 32, figs. 8, 9, pl. 33, figs. 1–8.

Procarnites skanderbegis Arthaber, 1911: 216, pl. 18(2), figs. 6, 7; Diener, 1915: 229; C. Renz, 1928: 155; Spath, 1934: 182; Renz and Renz, 1947: 61; Renz and Renz, 1948: 82, pl. 8, figs. 4–4a.

Procarnites andrusovi Kiparisova, 1947 (Bajarunas, 1936, *nom. nud.*): 132, pl. 28, figs. 2–4, text-figs. 11–13; Astakhova, 1960b: 149.

Procarnites oxynostus Chao, 1959: 88, 254, pl. 32, figs. 1–7, 10–12, text-figs. 28a–d.

This is another, rather common and distinctive species in late Scythian faunas of Tethys and closely related regions. My collections from the *Subcolumbites* fauna of Kotal-e-Tera contain two specimens of rather poor preservation. The distinctness of the conch shape and suture of this species makes identification easy. The specimen which is illustrated on Plate 1, figure 16 has a diameter of 51 mm and an umbilical diameter of 9 mm. The second specimen is not quite as well preserved but does show the suture which, though weathered, is clearly that of this species.

A complete analysis of all species of *Procarnites* can be found in Kummel (1968b). The long synonymy reflects a great deal of misconception regarding this species. Examination of Arthaber's (1908, 1911) original types from Albania and the large collection of this species from Chios, studied by Renz and Renz, has given a clearer perspective to the nature of variation in this species. On the basis of this analysis it can readily be established that within Tethys there is only a single species of *Procarnites*, namely *Procarnites kokeni*. This species is also known from Kwangsi, China (Chao, 1959), where, however, another unique species of this genus is also present, namely the specimen described as *Digitophyllites suni* (Chao, 1950, 1959). *Megaphyllites immaturus* Kiparisova (1947) from the Primorye Region and *Procarnites modestus* Tozer (1965) from British Columbia I believe to be one and the same species, differing from *P. kokeni* in the presence of constrictions.

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10154 (Pl. 1, fig. 16), MCZ 10155, 10171 (unfigured specimens).

Family PARANANNITIDAE Spath, 1930

Genus *JUVENITES* Smith, 1927

Type species, *Juvenites kraffti* Smith, 1927

Juvenites cf. *septentrionalis* Smith, 1932

Plate 3, figure 1

Juvenites septentrionalis Smith, 1932: 110, pl. 31,

figs. 31–40; Kummel and Steele, 1962: 687, pl. 100, figs. 1–11.

Juvenites sanctorum Smith, 1932: 110, pl. 31, figs. 22–30.

Nannites sinuosus Kiparisova, 1947: 141, pl. 28, figs. 6–8.

Nannites sinuosus var. *pressula* Kiparisova, 1947: 141, fig. 27.

This species is one of the more common and distinctive forms in the *Owenites* Zone of western United States. My collections from the *Owenites* fauna at Kotal-e-Tera, Afghanistan, contain a single, slightly crushed individual that does not show a suture. However, the uniqueness of the conch shape and pattern of ribbing is such that there is every reason to believe it is very closely related to *J. septentrionalis* if not conspecific with it. Kummel and Steele (1962) have given data on the range of intraspecific variation that is present in at least one population of this species. On the basis of these data I fail to see the distinctness of *Nannites sinuosus* Kiparisova (1947) from an *Owenites* fauna in the Caucasus Mountains. There is some similarity between *J. septentrionalis* and the Himalayan *J. herberti* (Diener), *J. hindostanus* (Diener), and *J. medius* Krafft and Diener. Evaluation of the differences among these species is difficult since the Himalayan species were based on only one or two specimens per species. Similar forms have been described from the beds with *Owenites egrediens* in Timor by Welter (1922).

Occurrence. *Owenites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10162 (Pl. 3, fig. 1).

Genus *ISCULITOIDES* Spath, 1930

Type species, *Isculites originis* Arthaber, 1911

Isculitoides cf. *originis* (Arthaber)

Plate 1, figures 12–15

Isculites originis Arthaber, 1911: 259, pl. 23(7), figs. 1–10; Diener, 1915: 157; C. Renz, 1928: 155; Kutassy, 1933: 540; Renz and Renz, 1947: 60; Renz and Renz, 1948: 33, pl. 13, figs. 7–7a, 9–9a, 11–11b, 12–12b, pl. 14, figs. 6–6a, 9–9a.

Isculitoides originis,—Spath, 1934: 198, pl. 14, figs. 2a–d, text-figs. 59b, c.

Isculites globulus Renz and Renz, 1947: 60, 74; Renz and Renz, 1948: 34, pl. 34, figs. 4–4a, 5–5a, 8–8b, 10–10c, 11–11b.

Isculites antiglobulus Renz and Renz, 1947: 60, 74; Renz and Renz, 1948: 35, pl. 13, figs. 1–1a, 10–10a, pl. 13, figs. 2–2a, 3–3a, 5–5a, 8–8a.

Isculites globulus-originis Renz and Renz, 1947: 60, Renz and Renz, 1948: 35, pl. 13, figs. 6–6a, pl. 14, figs. 1–1a, 2–2a, 3–3a.

Isculites globulus-antiglobulus Renz and Renz, 1947: 60; Renz and Renz, 1948: 35, pl. 13, figs. 4–4a, pl. 14, figs. 7–7a.

Two incomplete, but fairly well preserved, specimens in the collection are closely allied but most probably not conspecific with *Isculitoides originis*. The conch is highly involute and with depressed whorls. The lateral areas and the venter are broadly rounded. The umbilical shoulder is subangular and the umbilical wall nearly vertical. The suture is shown on Figure 5B.

Isculitoides originis is one of the most common species in the *Subcolumbites* fauna of Chios. A complete restudy of the very large collection assembled by Renz and Renz has been undertaken by Kummel (1968b). In that review are included the documentation and discussion to show that this species displays a large degree of variation in width of the conch and in size of the umbilicus. In the Chios population of *Isculitoides originis*, the umbilical shoulder is always well rounded, even in the more depressed forms, in contrast to the subangular umbilical shoulder of the specimens recorded here. Among the known species of *Isculitoides*, only *originis* from Chios is known from a large number of specimens. The same species is also quite abundant in the *Subcolumbites* fauna of Albania, where Arthaber (1911) records 54 specimens in his collections. This same species (*originis*) is also known from Nifoekoko, Timor (Spath, 1934: 198). The genus *Isculitoides* is represented in the Narmia Formation, in the Salt Range of West Pakistan (Kummel, 1966). However,

because of poor preservation the specific affinity of these Pakistan specimens cannot be determined. The late Scythian fauna of Kwangsi, China, contains *Isculitoides ellipticus* Chao (1959). This appears to be a more compressed form. The late Scythian of the Primorye Region contains *Isculitoides suboviformis* Kiparisova (1954, 1961). This species has a highly depressed whorl section but is otherwise quite like the Afghan specimens recorded here. The upper Thaynes formation of southeast Idaho contains a species of *Isculitoides* that is quite like the specimens described here (Kummel, 1968b). The Tobin Formation of Nevada also contains a new species of *Isculitoides* but this is quite different from the Afghan forms (Kummel, 1968b). Finally *Isculitoides minor* Tozer (1965) from British Columbia is quite similar to the Kwangsi *I. ellipticus* and the forms from the Thaynes Formation of southeast Idaho. Small globular ammonoids, as *Isculitoides*, are very difficult forms to study. Few large populations of *Isculitoides* are known; most species of this genus are known from small and often poorly preserved samples; at the same time, however, the genus is represented in most late Scythian faunas and in some of these it is a dominant form.

Occurrence. *Subcolumbites* fauna at Kotal-e-Tera, Afghanistan.

Repository. MCZ 10140 (Pl. 1, figs. 14, 15), MCZ 10149 (Pl. 1, figs. 12, 13), MCZ 10167 (unfigured specimen).

Genus *SUBCOLUMBITES* Spath, 1930

Type species, *Columbites perrinismithi* Arthaber, 1908

Subcolumbites perrinismithi (Arthaber)

Plate 1, figures 1–3

Columbites perrinismithi Arthaber, 1908: pl. 12, fig. 1; Arthaber, 1911: 262, pl. 23(7), figs. 19, 20; Diener, 1915: 112; C. Renz, 1928: 155; Renz and Renz, 1947: 59; Renz and Renz, 1948: 20, pl. 11, figs. 7–7a.

Subcolumbites perrinismithi,—Spath, 1930: 77; Spath, 1934: 203, pl. 12, figs. 5a, b; Kummel, *in* Arkell et al., 1957: 140, figs. 172, 15a, b.

Columbites europaeus Arthaber, 1908: 278, pl. 12, fig. 2; Arthaber, 1911: 261, pl. 23(7), figs. 13–18; Diener, 1915: 112; C. Renz, 1928: 155; Renz and Renz, 1947: 59; Renz and Renz, 1948: 19, pl. 11, figs. 3–3a, 4–4a, 5–5a, 6–6a.

Subcolumbites europaeus,—Spath, 1934: 204, pl. 12, figs. 6a, b, text-fig. 62c.

Columbites europaeus perrinismithi Renz and Renz, 1947: 59; Renz and Renz, 1948: 20, pl. 11, figs. 1–1b, 2–2b.

Columbites mirditensis Arthaber, 1911: 263, pl. 24(8), figs. 2, 3, 4; Diener, 1915: 112; C. Renz, 1928: 155; Renz and Renz, 1947: 59; Renz and Renz, 1948: 21.

Subcolumbites mirditensis,—Spath, 1934: 205.

Subcolumbites kwangsianus Chao, 1959: 128, 304, pl. 30, figs. 14–17, text-fig. 41c.

Columbites asymmetricus Chao, 1959: 127, 303, pl. 30, figs. 10–13.

Subcolumbites cf. *perrinismithi*,—Bando, 1964: 99, pl. 3, figs. 18, 19, pl. 4, fig. 3.

This very distinctive species is represented in the collection by two fragmentary specimens. The larger of the specimens (Pl. 1, fig. 1) shows the typical fine, forwardly projecting ribbing of the species. On the smaller specimen the ribbing is only faintly developed but this appears to be due mainly to preservation. The smaller specimen has a diameter of 15 mm, and at that stage the venter is broadly rounded. Due to faulty preservation one can't be sure if the venter of the larger specimen sharpens, at least a little, as in some of the specimens of this species from Albania and Chios. The suture (Fig. 5A) is visible on the smaller of the specimens and is quite typical for the species.

This species is a common member of latest Scythian faunas from Albania, Chios, Kwangsi, and Japan. The synonymy given above reflects the multiplicity of names that have been introduced for this species. Restudy of all the critical type collections, except those from China, clearly shows the real relationship of all these forms. A thorough discussion of this species is given in Kummel (1968b).

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10138 (Pl. 1, figs. 2, 3), MCZ 10146 (Pl. 1, fig. 1).

Genus *VICKOHLERITES* Kummel, 1968

Type species, *Prenkites sundaicus* Welter, 1922

Vickohlerites cf. *sundaicus* (Welter)

Plate 1, figure 4

Prenkites sundaicus Welter, 1922: 150, pl. 168 (14), figs. 18–21; Kutassy, 1933: 621; C. Renz, 1945: 301; Renz and Renz, 1947: 60; Renz and Renz, 1948: 29, pl. 12, fig. 1; Chao, 1959: 306.

"*Prenkites*" *sundaicus*,—Spath, 1930: 77; Spath, 1934: 188, 209.

Vickohlerites sundaicus,—Kummel, 1968a: 9, pl. 1, figs. 6, 7.

A single, incomplete specimen in the collection is allied to the specimen from Timor assigned to *Prenkites sundaicus* by Welter (1922) and which Kummel (1968a) selected as the type of his new genus *Vickohlerites*. The specimen on hand has a diameter of approximately 43 mm. The venter on the inner whorls, at a diameter of approximately 20 mm, is distinctly flattened with rounded ventral and umbilical shoulders. The maximum width of the whorl is at the midline of the lateral areas. On the following volution, at a diameter of approximately 25 mm, the venter is arched but the cross section of the whorls is still much broader than high. At the maximum diameter of the specimen the venter is more highly arched and the width and breath of the whorls more equal in dimensions. At this diameter also the maximum width is at the umbilical shoulder.

The type specimen of *Prenkites sundaicus* from Timor has depressed whorls at all stages, though the degree of depression decreased adorally. Likewise, throughout the ontogeny of the Timor specimen the maximum width is at the umbilical shoulder. Also the umbilical shoulder is acutely rounded in all growth stages.

The suture on the Afghan specimen is reproduced on Figure 5C. The first lateral lobe is entirely on the venter, the second lateral lobe is on the lateral area and the auxiliary lobe is on the umbilical wall. The suture of the holotype of *Vickohlerites sundaicus* is reproduced on Figure 5D. The number of elements in these two sutures is the same but the shape of the saddles and lobes and the pattern of denticulation are quite different. This raises a question as to whether this Afghan specimen is even generically allied to the type of *Vickohlerites sundaicus* from Timor. There is a degree of similarity in the pattern of the suture of this Afghan specimen to the suture of *Zenoites* represented in the *Subcolumbites* fauna of Chios. *Zenoites*, however, is a genus characterized by strong constrictions and these are not present on my Afghan specimen. Likewise, the suture of the Afghan specimen is similar to that of *Chioceras*, another unique genus of the *Subcolumbites* fauna of Chios. Here again though, there is a striking difference in conch morphology, as *Chioceras* has a prominent ventral keel.

Critical comparison of the Afghan and Timor forms is difficult as each is represented by a single specimen. There is an overall similarity between the two specimens, but intriguing differences in whorl shape and suture. The specimens are surely specifically distinct and perhaps even generically. However, the Afghan specimen is too poorly preserved to be selected as the type of a new species and genus. The identification given here reflects its closest affinities based on the data available.

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10141 (Pl. 1, fig. 4).

Genus *MEROPELLA* Renz and Renz, 1947

Type species, *Arianites* (*Meropella*) *plejanae* Renz and Renz, 1947

Meropella cf. *plejanae* Renz and Renz

Plate 1, figures 10, 11

Arianites (*Meropella*) *plejanae* Renz and Renz, 1947: 67, 79; Renz and Renz, 1948: 95, pl. 3, figs. 3–3b, 11–11b.

Meropella plejanae,—Kummel, *in* Arkell et al., 1957: L140, fig. 172, 12.

This genus and species had previously been known only from a few specimens in

the *Subcolumbites* fauna of Chios. The specimen recorded here is incomplete and somewhat poorly preserved. The diameter is 18 mm, width of adoral whorl about 9 mm, height about 4 mm and the umbilical diameter is approximately 10 mm. The whorls are depressed, with a broadly arched venter and narrow, rounded, lateral areas. This Afghan specimen differs from the Chios forms in its highly depressed whorls. In the Chios specimens the width and height of the whorls are approximately equal. The suture is only vaguely discernible on my specimen. On the ventral region one can see a narrow lanceolate ventral lobe, adjoined by a phylloid first lateral saddle and then the first lateral lobe. A second lateral lobe straddles the ventral shoulder, and a small auxiliary lobe is vaguely indicated on the umbilical wall. The base of the lobes are not observable so the nature of the denticulation, if any, is not known. The Chios *M. plejanae* has this same general suture pattern.

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10142 (Pl. 1, figs. 10, 11).

Family MEEKOCERATIDAE Waagen, 1895

Genus *WYOMINGITES* Hyatt, 1900

Type species, *Meekoceras aplanatum* White, 1880

Wyomingites aplanatus (White)

Plate 3, figures 12–14

Meekoceras aplanatum White, 1879: 112; 1880: 112, pl. 31, figs. 1a, b, d (not c); Smith, 1904: 373, pl. 41, figs. 4–6; Hyatt and Smith, 1905: 146, pl. 11, figs. 1–14, pl. 64, figs. 17–22, pl. 77, figs. 1, 2.

Meekoceras (Gyronites) aplanatum,—Diener, 1915: 196.

Xenodiscus aplanatus,—Mojsisovics, 1886: 75.

Xenaspis ? aplanata,—Waagen, 1895: 290.

Ophiceras aplanatum,—Frech, 1902: 631; 1908, pl. 61, fig. 1.

Flemingites aplanatus,—Smith, 1932: 51, 52, pl. 11, figs. 1–14, pl. 22, figs. 1–23, pl. 39, figs. 1, 2, pl. 64, figs. 17–32.

Wyomingites aplanatus,—Hyatt, 1900: 556; Spath, 1934: 250, 251, fig. 84; Kummel, 1954: 185; Kummel, *in* Arkell et al., 1957: L142, figs. 175, 7a–c.

Wyomingites cf. *aplanatus*,—Kummel, 1959: 444, figs. 5, 6; Kummel and Steele, 1962: 696, pl. 99, figs. 3, 4.

My collections from the *Owenites* Zone at Kotal-e-Tera contain five, more or less fragmentary, specimens of only fair preservation of this species. The largest specimen has a diameter of approximately 65 mm. The species is comprised of forms with compressed, evolute conchs and flattened venter; the whorl sides are only slightly arched. The suture is shown on Figure 5J.

This species was first described on the basis of specimens from the *Meekoceras* limestone of southeast Idaho, and is quite common in the *Owenites* Zone of western United States. The Afghan specimens recorded here agree in all essential features to the specimens from western United States. Though I have fairly extensive collections of this species from the *Meekoceras* limestone of southeast Idaho, most specimens are too incomplete to yield significant measurements. I can, however, match my Afghan specimens to those from Idaho with no difficulty. The suture also is essentially the same except for what appears to be a more highly developed auxiliary series on the umbilical shoulder and wall. It is, however, quite similar to the suture reproduced by Smith (1932: pl. 22, fig. 3) for a specimen of this species from southeast Idaho. My own collections of this species from southeast Idaho show that there is considerable variability in the shape, length, and pattern of denticulation of the auxiliary lobe. In summary, I can observe no significant differences between these Afghan specimens and those of *W. aplanatus* from western United States. I would also include here the fragmentary specimen from the small *Owenites* fauna of South Island, New Zealand (Kummel, 1959). In addition it is highly possible that the specimen from the *Arctoceras* fauna of Spitsbergen, assigned by Stolley (1911: 123, pl. 9, fig. 5)

to *Meekoceras (Gyronites) aplanatum* White, is correctly identified. Spath (1934: 251) considered this identification wrong and suggested that these forms should be referable to *Svalbardiceras* Frebold. This change in generic assignment was strongly influenced by his belief that the *Arctoceras* fauna of Spitsbergen was late Scythian in age. Kummel (1961) has presented arguments to establish that the *Arctoceras* fauna of Spitsbergen is of mid-Scythian, *Owenites* Zone, age.

Occurrence. *Owenites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10161 (Pl. 3, fig. 13), MCZ 10163 (Pl. 3, fig. 14), MCZ 10164 (Pl. 3, fig. 12), MCZ 10172 (unfigured specimens).

Family NORITIDAE Karpinsky, 1889

Genus *ALBANITES* Arthaber, 1909

Type species, *Pronorites triadicus* Arthaber, 1908

Albanites triadicus (Arthaber)

Plate 2, figures 1–9

Pronorites triadicus Arthaber, 1908: 264, pl. 11, figs. 4a–c; Arthaber, 1911: 204, pl. 17(1), figs. 8, 9; Diener, 1915: 231; C. Renz, 1928: 155; Kutassy, 1933: 624; Renz and Renz, 1947: 61; Renz and Renz, 1948: 84, pl. 14, figs. 14–14b.

Albanites triadicus,—Spath, 1934: 275, fig. 95.

Pronorites osmanicus Arthaber, 1911: 205, pl. 17(1), fig. 10; Diener, 1915: 231; C. Renz, 1928: 155.

Albanites osmanicus,—Spath, 1934: 276.

Pronorites cf. *osmanicus*,—Renz and Renz, 1947: 62; Renz and Renz, 1948: 86, pl. 15, figs. 6–6c.

Pronorites arbanus Arthaber, 1911: 205, pl. 17(1), figs. 11, 12; Diener, 1915: 230; Welter, 1922: 94, pl. 155, figs. 10–14; C. Renz, 1928: 255; Kutassy, 1933: 624; C. Renz, 1945: 301; Renz and Renz, 1947: 61; Renz and Renz, 1948: 85, pl. 14, figs. 13–13b, 15–15b, pl. 15, figs. 5–5c.

Albanites arbanus,—Spath, 1934: 277.

Pronorites arbanus var. *mediterranea* Renz and Renz, 1947: 62; Renz and Renz, 1948: 85, pl. 14, figs. 12–12b.

Pronorites spec. ind. ex aff. *arbani*,—Welter, 1922: 95, pl. 155(1), fig. 9.

Anasibirites gracilis Kiparisova, 1947: 164, pl. 39, figs. 3, 4, text-figs. 60, 61.

Pronorites arbanus var. *sundaica* Renz and Renz, 1948: 85.

Albanites welteri Spath, 1934: 278.

Pronorites oriental is Renz and Renz, 1947: 62; Renz and Renz, 1948: 86, pl. 15, figs. 2–2b.

Pronorites shaubi Renz and Renz, 1947: 62, 78; Renz and Renz, 1948: 87, pl. 15, figs. 4–4a.

Pronorites shaubi var. *timorensis* Renz and Renz, 1948: 87.

Pronorites shaubi var. *kephalovunensis* Renz and Renz, 1947: 62, 78; Renz and Renz, 1948: 87, pl. 15, figs. 3–3a.

Pronorites reicheli Renz and Renz, 1947: 62, 79; Renz and Renz, 1948: 88, pl. 15, figs. 1–1c.

Albanites danispancusis (Astakhova) 1960a: 143, pl. 34, figs. 4, 5; Astakhova, 1960b: 150.

Aspidites hasserti Arthaber, 1911: 249, pl. 21(5), fig. 16; Spath, 1934: 275.

Meekoceras (Koninckites) hasserti,—Diener, 1915: 198.

Dagnoceras komanum Arthaber, 1911: 242, pl. 21(5), fig. 11; Diener, 1915: 115; Smith, 1932: 65; Spath, 1934: 269, 275.

Pseudosibirites cfr. *dichotomus* Waagen, Arthaber, 1911: 254, pl. 22(6), fig. 8.

Anasibirites cfr. *dichotomus*,—Arthaber, 1911: 273.

Sibirites cf. *dichotomus*,—Diener, 1915: 255.

This species, though never occurring in any great abundance, is present in most of the late Scythian faunas known from Tethys. Justification and discussions of the long synonymy of this species is given in Kummel (1968b). There have been seven species and four variety names introduced for this group. Aside from extremely narrow conceptions of species, poor preservation and preparation of specimens accounts for at least some of the multiplicity of names. The *Subcolumbites* fauna of Kotal-e-Tera has yielded six specimens of this species, five of which are illustrated on Plate 2, figures 1–9. The sutures from two of the specimens are shown on Figures 5F, G. The smallest of these specimens has a diameter of 21 mm and the largest a diameter of approximately 47 mm. All the specimens are phragmocones. The flattened venter with distinct cross ridges is a conspicuous feature of this species. One specimen (Pl. 2, figs. 8, 9) has slightly more rounded ventral shoulders. This, however, is a variation that can readily be seen in the larger Albanian and Chios populations

of this species. None of the specimens preserve a perfect suture due to factors of weathering and the nature of the preservation. However, even though details are obscured, the suture (Figs. 5F, G) is identical to that for other members of this species.

As now understood, *Albanites triadicus* is the only species of the genus *Albanites* and is confined to Tethys. This species is present in the *Subcolumbites* fauna of Albania and Chios, in the *Columbites* Zone of Astakhova (1960a, b) on the Mangyshlak Peninsula, the *Subcolumbites* fauna of Kotal-e-Tera, Afghanistan, and in the *Prohungarites* fauna of Timor.

Occurrence. *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10136 (Pl. 2, figs. 6, 7), MCZ 10145 (Pl. 2, fig. 1), MCZ 10152 (Pl. 2, figs. 8, 9), MCZ 10153 (Pl. 2, figs. 4, 5), MCZ 10156 (Pl. 2, figs. 2, 3), MCZ 10168 (unfigured specimens).

Family PRIONITIDAE Hyatt, 1900

Genus *HEMIPRIONITES* Spath, 1929

Type species, *Goniodiscus typus* Waagen, 1895

Hemiprionites typus (Waagen)

Plate 3, figures 2–9

Goniodiscus typus Waagen, 1895: 128, pl. 9, figs. 7–10; Diener, 1915: 135; Mathews, 1929: 31, pl. 5, figs. 5–21.

Hemiprionites typus,—Spath, 1929: 270; Spath, 1934: 330, fig. 114; Kummel, *in* Arkell, et al., 1957: L144, fig. 177, 3.

This species is represented by a single well preserved specimen of approximately 55 mm in diameter. The species is characterized by a highly compressed involute conch and a tabulate venter.

The types of this species consist of four, mainly fragmentary, poorly preserved specimens from the Upper Ceratite limestone of the Salt Range in West Pakistan. This is the upper part of the Mittiwali Member of the Mianwali Formation of Kummel (1966). The lectotype (Waagen, 1895: pl. 9, figs. 8a–c; Pl. 3, figs. 2, 3 of this report) is a very poorly preserved phragmocone that consists of only a portion of the venter and one side of the conch. The specimen measures about 29.0 mm in diameter, 11.0 mm for the width of the adoral whorl, 15.7 mm for the height, and 5.4 mm for the diameter of the umbilicus. The poor preservation makes highly doubtful the presence of the cross ridges on the venter as in Waagen's reconstruction of this specimen. Only parts of the suture are visible and these are highly weathered. The three remaining paralectotypes are equally poor specimens. The suture illustrated by Waagen (1895: pl. 9, fig. 9) was taken from a small fragment of whorl section (Pl. 3, fig. 8) that is also weathered. The illustration of the smallest of Waagen's specimens (1895: pl. 9, fig. 10; Pl. 3, figs. 6, 7 of this report) is highly inaccurate. There are no serrations on the ventral shoulders and the lateral ornament is nothing more than very faint growth lines. Finally, the illustration reproduced by Waagen (1895: pl. 9, fig. 7; Pl. 3, fig. 9 of this report) of the largest of his specimens bears little resemblance to the actual specimen.

The basic form of the conch of my Afghan specimen is essentially the same as that of the type specimens of Waagen from the Salt Range of West Pakistan. The suture on the Afghan specimen is not clearly visible, but there appears to be some difference, in the shape of the saddles, with the suture of Waagen's paralectotype. My own extensive collections from the Upper Ceratite limestone, and especially from Chhidru where Waagen collected his specimens of *H. typus*, contain a fair number of specimens of this species, though the preservation is not much better than that of Waagen's material. However, within this collection, variability in the shape of the lobes and saddles is quite evident. Though both the Salt Range and Afghan specimens are poorly preserved, I have no doubt but they are conspecific.

Kummel and Erben (1968) described an-

other species of *Hemiprionites*, *H. hungeri*, from the *Owenites* beds at Kotal-e-Tera. This species is very distinct in the larger size of the umbilicus and transverse ribs on the truncated venter. *Hemiprionites timorensis* Spath (1934: 331) from the *Anasibirites* beds of Timor is very nearly allied to the type species, as are the American species of *Hemiprionites* described by Mathews (1929) and the Spitsbergen species described by Spath (1934). There is a distinct possibility that all these forms are conspecific; however, because of the poor preservation and incompleteness of data on the Tethyan specimens, it seems best to keep them distinct for the time being.

Occurrence. *Owenites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10159 (Pl. 3, figs. 4, 5).

Family SIBIRITIDAE Mojsisovics, 1896

Genus *WASATCHITES* Mathews, 1929

Type species, *Wasatchites perrini* Mathews, 1929

Wasatchites sp. indet.

Plate 3, figures 10, 11

This species is represented in the collection by two specimens of fair to poor preservation. The better of the two specimens, illustrated in Plate 3, figures 10, 11, has a diameter of 30.5 mm. The distinguishing features of the genus are clearly evident. These are: the compressed conch, with convergent whorl sides, and a low arched venter; prominent umbilical nodes from which radiate two ribs that decrease in size toward the venter. The suture is not preserved.

The genus *Wasatchites* is a conspicuous member of the so-called "*Anasibirites*" fauna and is characteristic of the *Anasibirites* Subzone of the *Owenites* Zone. All of the numerous species of this genus look very much alike. The type species is based on specimens from the *Anasibirites* fauna of Fort Douglas, Utah (Mathews, 1929). My Afghan specimen is very similar to the type species and could very well be conspecific with it. However, better preserved specimens are needed to establish this relationship with any degree of certainty. Species of this genus have been described from British Columbia (McLearn, 1945), Axel Heiberg Island (Tozer, 1961) and Spitsbergen (Spath, 1934). In each of these areas the genus occurs within the mid-Scythian *Owenites* Zone. The genus is also present in the Upper Ceratite limestone of the Salt Range, West Pakistan.

Occurrence. *Owenites* fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10158 (Pl. 3, figs. 10, 11), MCZ 10160 (unfigured specimen).

Genus *KEYSERLINGITES* Hyatt, 1900

Type species, *Ceratites subrobustus* Mojsisovics, 1885

Keyserlingites sp. indet.

Plate 1, figures 5–7

A small specimen of 22 mm in diameter is our first record of the genus *Keyserlingites* in late Scythian strata of Tethys. The specimen appears to be all phragmocone and has a whorl height of 9 mm and an umbilical diameter of 7.5 mm. The whorl sides are slightly convex and converge toward a broadly rounded venter. The umbilical shoulder is abruptly rounded and the umbilical wall nearly vertical. There are large nodes, one approximately every quarter volution, that are anchored on the umbilical shoulder and extend upward on the flanks. The most adoral node, at a diameter of 21 mm, extends half way across the lateral areas. The suture consists of a simple pronged ventral lobe, a large first lateral saddle and first lateral lobe, and much smaller second lateral saddle and lobe; low, denticulated auxiliary lobe occupies the umbilical wall (Fig. 5E). Two small specimens of only fair preservation are believed to be even younger stages of this species. The specimen illustrated on Plate 1, figures 6, 7 has faint indication of the umbilical nodes and a suture with the basic pattern of that of the larger specimen.

The general shape of the conch, the nodes, and the suture identify this specimen as *Keyserlingites.* The specimen is most probably a juvenile form. On the basis of studies on several well preserved specimens of *Keyserlingites subrobustus* from British Columbia and Ellesmere Island, Tozer (1965) has been able to clarify the relations between *Keyserlingites* and *Durgaites.* Tozer's suggestion, however, that the Himalayan "*Durgaites*" *dieneri* and the Timor "*D.*" *angustecostatus* may be late Scythian in age, rather than Anisian, as concluded by Diener (1907, 1912), Spath (1934) and Welter (1915), is rejected. The full aspect of this problem has been discussed by Kummel (1968b). *Keyserlingites* is known mainly from the circum-Arctic region where two species are present in late Scythian strata. One of these species, *Keyserlingites subrobustus* Mojsisovics, is present in northern Siberia, Spitsbergen, Ellesmere Island, and in British Columbia. A second species, *Keyserlingites middendorffi* (Keyserling) is known only from northern Siberia. The *Prohungarites* fauna of the Thaynes Formation of southeast Idaho contains two species of *Keyserlingites*, and the underlying *Columbites* fauna a single species. Zakharov (personal communication) reports the occurrence of another new species of this genus in late Scythian strata of the Primorye Region.

Occurrence. Subcolumbites fauna, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10139 (Pl. 1, figs. 6, 7), MCZ 10143 (Pl. 1, fig. 5), MCZ 10144 (unfigured specimen).

Family USSURITIDAE Hyatt, 1900

Genus *LEIOPHYLLITES* Diener, 1915

Type species, *Monophyllites suessi* Mojsisovics, 1882

Leiophyllites sp. indet.

Plate 2, figure 10

This identification is based on a single, loose, weathered, incomplete specimen lying on the strata of the *Prohungarites* Zone. The topography of the outcrop and matrix of the specimen support the contention that the specimen is from the *Prohungarites* Zone. The specimen consists of little more than a quarter of a complete conch and is all phragmocone. The inner whorls are highly weathered, the outer whorl to a much lesser extent. The evolute nature of the conch and compressed whorls is clearly evident. These features of the conch plus the suture (Fig. 5I) establish at least the generic affinity of the form.

The genus *Leiophyllites* is represented in the *Subcolumbites* fauna of Albania and Chios, in the *Stacheites* Zone of Astakhova (1960a) on the Mangyshlak Peninsula, in the *Subcolumbites* faunas of Kwangsi, China, and in the Primorye Region. It is also apparently present in late Scythian strata of British Columbia (Tozer, 1965).

Occurrence. Loose specimen, presumably from *Prohungarites* Zone, Kotal-e-Tera, Afghanistan.

Repository. MCZ 10151 (Pl. 2, fig. 10).

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PLATE 1. SUBCOLUMBITES, VICKOHLERITES, KEYSERLINGITES, SUBVISHNUITES, MEROPELLA, ISCULITOIDES, PROCARNITES

Figure		Page
1–3	*Subcolumbites perrinismithi* (Arthaber) 1, MCZ 10146, × 2; 2, 3, MCZ 10138, × 2.	495
4	*Vickohlerites* cf. *sundaicus* (Welter) MCZ 10141, × 1.	496
5–7	*Keyserlingites* sp. indet. 5, MCZ 10143, × 1.5; 6, 7, MCZ 10139, × 2.	500
8, 9	*Subvishnuites* cf. *enveris* (Arthaber) MCZ 10148, × 1.	491
10, 11	*Meropella* cf. *plejanae* Renz and Renz MCZ 10142, × 2.	496
12–15	*Isculitoides* cf. *originis* (Arthaber) 12, 13, MCZ 10149, × 2; 14, 15, MCZ 10140, × 2.	494
16	*Procarnites kokeni* (Arthober) MCZ 10154, × 1.	493

All specimens from *Subcolumbites* fauna, Kotal-e-Tera, Afghanistan.

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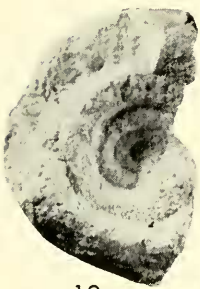

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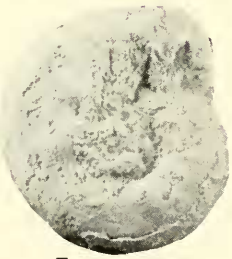

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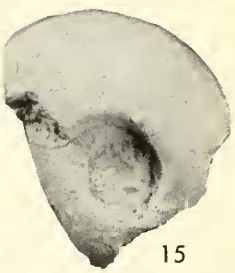

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PLATE 2. ALBANITES, LEIOPHYLLITES, XENOCELTITES AND SUBVISHNUITES

Figures		Page
1–9	*Albanites triadicus* (Arthaber). 1, MCZ 10145, × 1; 2, 3, MCZ 10156, × 2; 4, 5, MCZ 10153, × 2; 6, 7, MCZ 10136, × 1.5; 8, 9, MCZ 10152, × 2.	498
10	*Leiophyllites* sp. indet. MCZ 10151, × 1.	501
11–13	*Xenoceltites* sp. indet. 11, MCZ 10137, × 1.5; 12, 13, MCZ 10157, × 2.	492
14	*Subvishnuites* sp. indet. MCZ 10150, × 2.	489

All specimens from *Subcolumbites* fauna, Kotol-e-Tera, Afghaniston.

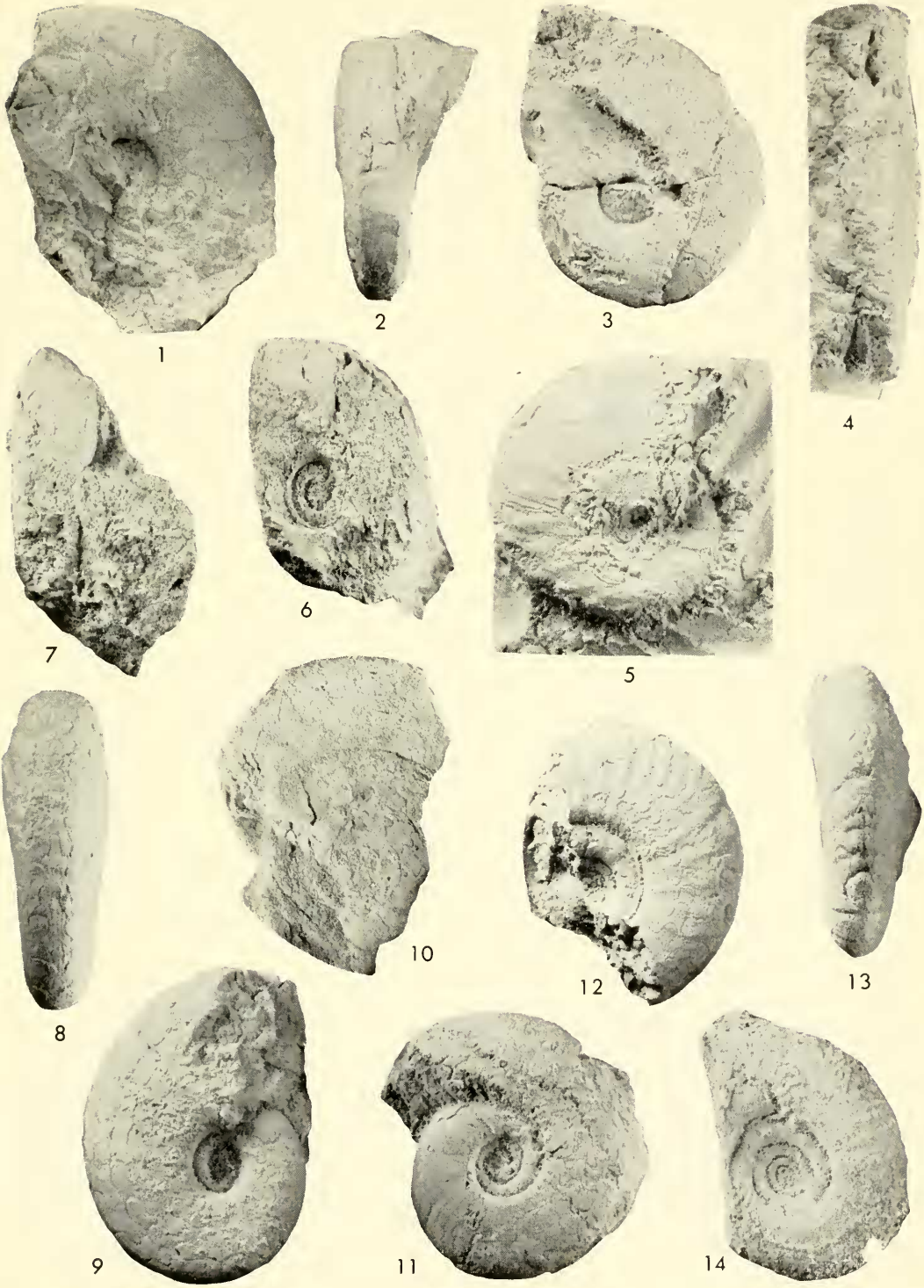
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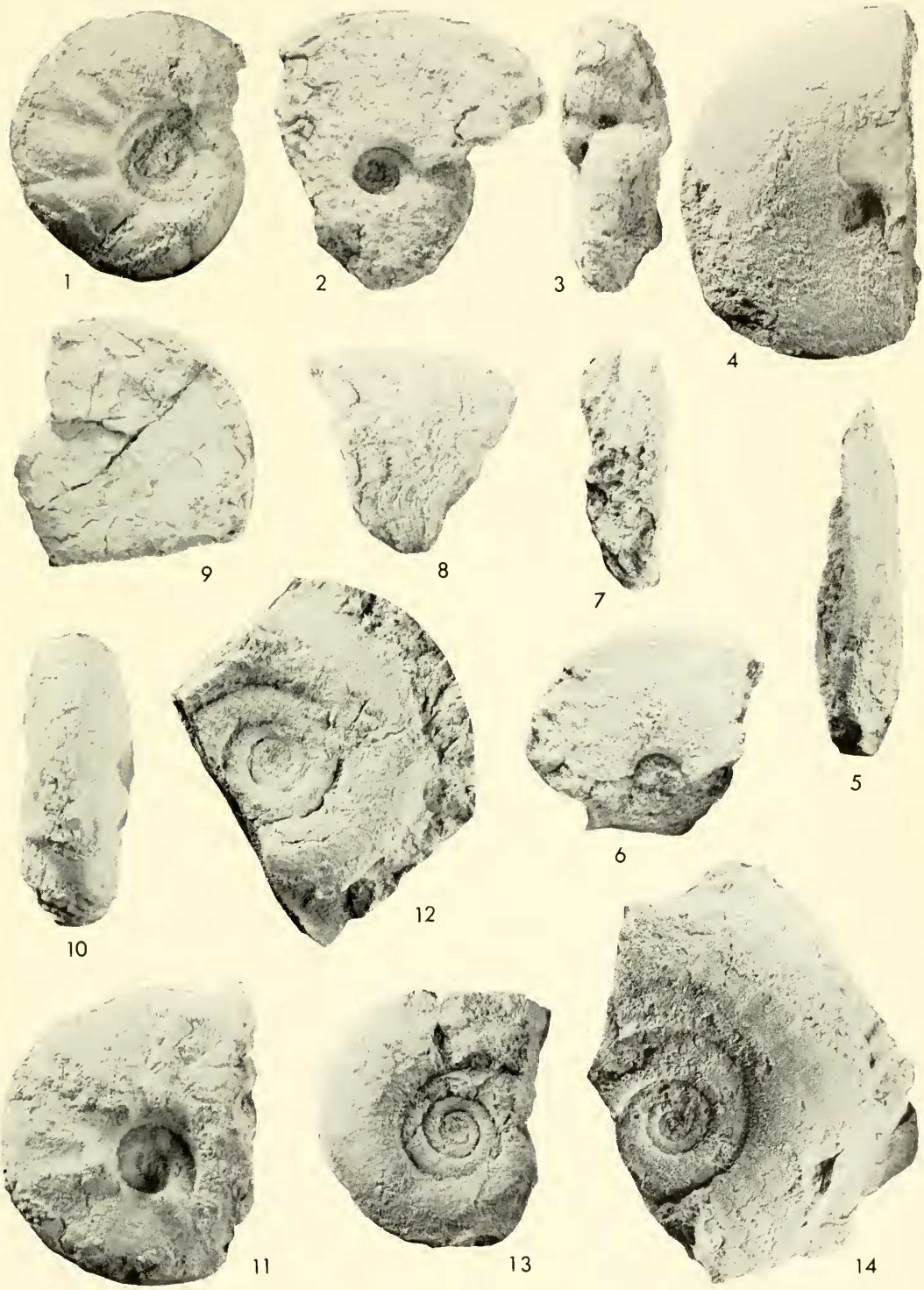
PLATE 3. JUVENITES, HEMIPRIONITES, WASATCHITES, AND WYOMINGITES

Figures		Page
1	*Juvenites* cf. *septentrionalis* Smith. From *Owenites* Zone, Kotal-e-Tera, Afghanistan. MCZ 10162, × 2.	493
2, 3	*Hemiprionites typus* (Waagen). From Upper Ceratite limestone at Chhidru, Salt Range, West Pakistan. Lectotype of Waagen (1895, pl. 9, fig. 8) GSI 7104, × 1.5.	499
4, 5	*Hemiprionites typus* (Waagen). From *Owenites* Zone, Kotal-e-Tera, Afghanistan. MCZ 10159, × 1.	499
6, 7	*Hemiprianites typus* (Waagen). From Upper Ceratite limestone at Chhidru, Salt Range, West Pakistan. Paralectotype of Waagen (1895, pl. 9, fig. 10) GSI 7106, × 1.5.	499
8	*Hemiprionites typus* (Waagen). From Upper Ceratite limestone at Chhidru, Salt Range, West Pakistan. Paralectotype of Waagen (1895, pl. 9, fig. 9) GSI 7105, × 1.	499
9	*Hemiprionites typus* (Waagen). From Upper Ceratite limestone at Chhidru, Salt Range, West Pakistan. Paralectotype of Waagen (1895, pl. 9, fig. 7) GSI 7103, × 1.	499
10, 11	*Wasatchites* sp. indet. From *Owenites* Zone, Kotal-e-Tera, Afghanistan. Ventral and lateral views, MCZ 10158, × 1.5.	500
12–14	*Wyomingites aplanatus* (White). From *Owenites* Zone, Kotal-e-Tera, Afghanistan. Lateral view of three specimens: 12, MCZ 10164; 13, MCZ 10161; 14, MCZ 10163, × 1.	497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